Design of the Enterprise Information Management System Based on the Big Data Technology of the Internet of Things

Zhanchuan Ma[1,a,*]

[1]*Heilongjiang University, Harbin, Heilongjiang, 150000, China*
[a]*15510722693@163.com*
[*]*Corresponding author*

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Abstract: In the current digital era, the application of big data technology in the design of enterprise information management system has important background significance. By collecting, processing and analyzing a large amount of device sensor data and user behavior data, the big data technology of the Internet of Things (IOT) provides enterprises with a comprehensive and detailed data base for enterprises, and significantly improves the decision support and business optimization capabilities of enterprises. This study proves the significant benefits of the IOT big data technology in the design of enterprise information management system through practical case studies and numerical analysis. The experimental results show that among the enterprises using the big data technology of the IOT, the highest production efficiency of enterprise B reaches 0.92, and the lowest failure rate of enterprise E equipment is only 0.01. It shows that the application of big data technology of the IOT has an important impact on the development and success of enterprises. This can provide a valuable decision-making basis for enterprise managers, but also provides a useful reference for researchers and practitioners in related fields.

1. Introduction

With the rapid development of the IOT technology and the increasing maturity of big data analysis technology, enterprises are facing an unprecedented data explosion. The wide application of various sensor devices, intelligent terminals and cloud computing platforms enables enterprises to collect, store and process large amounts of real-time data [1-2]. These data contain rich information on the production, operation, sales and other links of the enterprise. In front of such massive data, the traditional enterprise information management system has been unable to meet the needs of enterprises for efficient management and commercial value mining [3-4]. In view of this problem, the enterprise information management system based on the IOT big data technology of things came into being. This system is based on the IOT technology, combined with advanced big data analysis algorithm and visualization technology, which can help enterprises to better understand and use their internal and external data resources, and improve the decision-making

ability and competitiveness of enterprises [5].

In recent years, many scholars and experts have studied the design of the enterprise information management system for the big data technology of the IOT. As an emerging technology, the IOT is revolutionizing changes to urban traffic management. Fan Y proposed a fine-grained parking reservation system in urban areas based on the IOT, aiming to solve the problem of urban parking difficulties. The system uses sensor network and cloud computing technology to monitor and manage parking Spaces in cities in real time, and predicts and allocates parking Spaces through intelligent algorithms, so as to optimize the utilization rate of urban parking resources. Users can book a parking space through the mobile app and view information on available parking spaces in real time. Experimental results show that the system can significantly alleviate the problem of urban parking difficulties, and improve the parking efficiency and user experience [6]. In a big data environment, data integrity audit is a critical task designed to ensure that data is not tampered with during transmission and storage. Yang G Has proposed a data integrity audit scheme based on dual-server public key decryption to meet the challenges of large-scale and distributed data. The scheme introduces two trusted entities called authentication servers, which uses public key encryption and digital signature technology to realize the security and integrity verification of data. One server is responsible for storing the data and the other server for verifying the integrity of the data and decrypting the data. By using public key encryption and digital signature during data transmission, it can ensure that the data would not be tampered with during transmission. The experimental results show that the scheme can efficiently conduct data integrity audit and protect the security of data. In short, the data integrity audit scheme based on dual-server public key decryption provides a feasible solution for data security in the big data environment [7]. With the rapid development of IOT technology, the number and scale of IOT devices are constantly increasing, and the authentication and security management of devices have become crucial. Watson E A proposes an IOT authentication framework based on the geographical positioning of industrial control systems, aiming to solve the security risks and vulnerabilities existing in the authentication process of IOT devices. The framework makes use of the geolocation technologies common in industrial control systems, such as GPS and wireless sensor networks, combining identity authentication and encryption technologies to achieve trusted authentication and secure communication for IOT devices. The framework ensures the legitimacy and security of the device by binding the device location with its identity information and combining geographic location verification with communication-based authentication. The experimental results show that the framework has high efficiency and reliability in the IOT device authentication, and can effectively deal with the attacks and security threats in the authentication process [8].

In this context, this paper would introduce the design of an enterprise information management system based on the big data technology of the IOT. The system aims to provide comprehensive data support and decision assistance for enterprises through data collection, storage and analysis. This paper would elaborate on the key technologies and implementation methods of the system from the aspects of requirement analysis, system design, function implementation and application promotion.

2. Application Method of the Big Data Technology of the IOT in Enterprise Information Management

2.1 IOT Technology

The IOT technology refers to the connection of sensors, devices, terminals and other physical objects through the Internet, and the realization of information transmission and data exchange between each other [9-10]. It brings unprecedented opportunities and challenges for enterprise

information management. The main components of IOT technology include sensor networks, communication technologies, data storage and processing technologies, and cloud computing platforms. Through the application of these technologies, enterprises can obtain and monitor all kinds of data in the physical environment in real time, providing comprehensive information to support for the production, operation and management of enterprises [11-12].

In the enterprise information management, the IOT technology can be applied in many aspects. For example, by deploying IOT sensors on production lines, companies can monitor various indicators in the production process in real time, identify potential problems, and adjust and optimize them in a timely manner. In addition, the IOT technology can also be used for supply chain management, by tracking logistics information in real time, to improve the visibility and efficiency of the supply chain, inventory status and traffic conditions [13-14]. At the same time, the IOT technology also supports the application of equipment management, energy consumption management and security management, as shown in Figure 1:
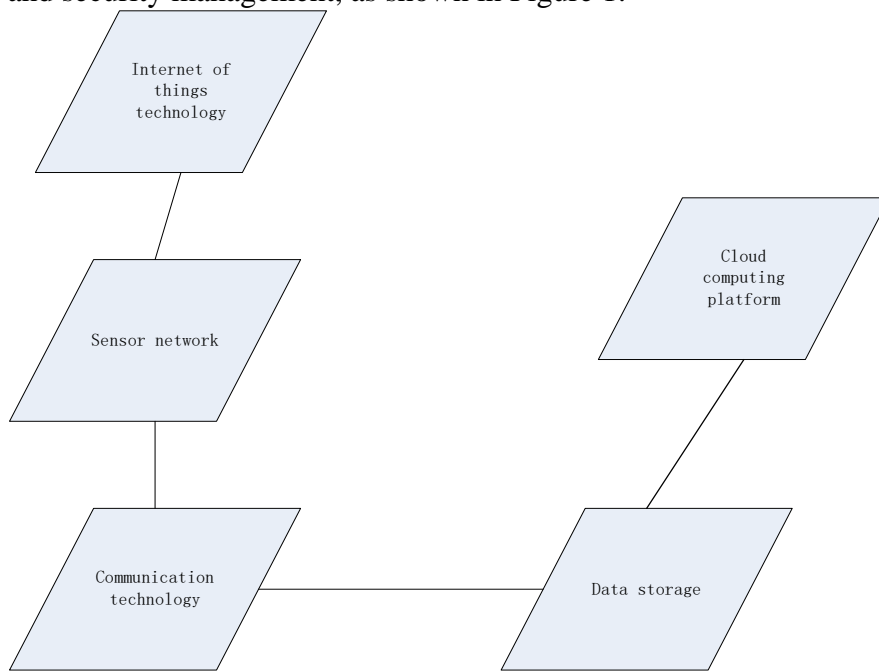

Figure 1: Main components of the IOT technology

2.2 Use of Intelligent Big Data Algorithm

Sampling-based clustering algorithms are often used in big data, which cluster only one sample and can be extended to the entire data set. It focuses on smaller data, thus reducing the time required for clustering, saving space, and improving the economy of data processing. Their number of samples is calculated as shown in Equation 1:

$$S = f \times n + \log a \qquad (1)$$

In formula 1, f is the proportion of extraction to the specified data, n is the data rule, and a represents the size of the cluster. The proportion of the extracted data is calculated as shown in formula 2:

$$f = \frac{a}{n} \qquad (2)$$

The number of iterations of the clustering algorithm is calculated as shown in Equation 3:

$$g = S \times \frac{\log a}{f} \qquad (3)$$

2.3 The Application of the IOT Big Data Technology in Enterprise Information Management

The application case of IOT big data technology in enterprise information management is increasingly rich in [15-16]. Here are some typical applications:

1) Production optimization and quality control

By deploying IOT sensors in production equipment and products, enterprises can monitor various indicators in the production process in real time, such as temperature, humidity, vibration, etc. Comparison and analysis of these data with historical data and standards can find abnormalities and problems in time, optimize and adjust them to improve production efficiency and product quality.

2) Visualization and optimization of the supply chain

Using the IOT technology and big data analysis technology, enterprises can track the logistics information, inventory conditions and traffic conditions in real time, and visually display the data in the supply chain management system.

By analyzing these data, companies can optimize nodes and processes in the supply chain, reduce inventory costs, improve distribution efficiency, and respond with emergencies and changing [17-18].

3) Equipment management and maintenance

By connecting devices and sensors with the IOT, companies can monitor their operating status, service life and failure in real time.

The IOT big data technology can collect and analyze the operation data of equipment, and help enterprises to realize the reasonable management and maintenance plan of equipment through predictive maintenance and fault warning.

At the same time, it can also provide visual analysis of equipment use data, help enterprises to identify bottlenecks and improvement points of equipment, and improve production efficiency and reliability.

4) Energy consumption management, energy conservation and emission reduction

The IOT big data technology can monitor and analyze the energy consumption data of enterprises, including electricity, water resources, fuel, etc.

Through real-time monitoring and analysis of energy consumption data, enterprises can find abnormal energy consumption and potential energy saving opportunities, and formulate corresponding energy consumption management strategies.

For example, by analyzing the energy consumption data of the production equipment, the equipment operation mode and energy utilization efficiency can be optimized, achieving the goal of energy saving and emission reduction [19-20].

5) Intelligent security and risk management

Combining the IOT and big data technology, enterprises can realize intelligent security and risk management. By installing security sensors and monitoring equipment in key areas of the enterprise, security data can be monitored and analyzed in real time, such as fire, theft, accident, etc. Through data processing and analysis, enterprises can find out security risks and abnormal situations in time, and take corresponding measures to deal with and prevent them, as shown in Figure 2:
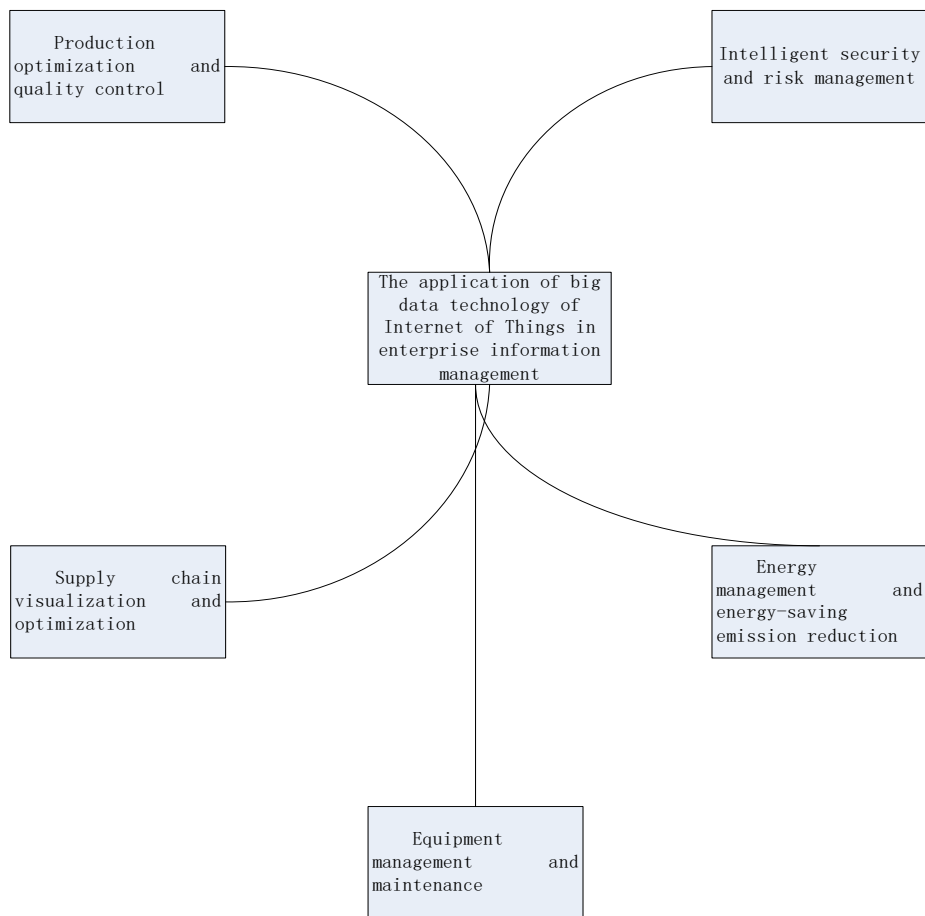
Production optimization and quality control

Intelligent security and risk management

The application of big data technology of Internet of Things in enterprise information management

Supply chain visualization and optimization

Energy management and energy-saving emission reduction

Equipment management and maintenance

Figure 2: Common Application Diagram of IOT Big data Technology in Enterprise Information Management

3. Enterprise Information Management System Design Experiment of IOT Big Data Technology

3.1 Design Purpose of Enterprise Information Management System of IOT Big Data Technology

This experiment aims to explore the application of IOT Big data technology in the design of enterprise information management system, and evaluate its effect. The specific objectives include: 1) evaluating the improvement of the data collection and processing capacity of the enterprise information management system by the Big data technology of the IOT. 2) Evaluate the role of IOT Big data technology in data analysis and mining in enterprise information management system. 3) Evaluate the impact of IOT Big data technology on decision support and business optimization in enterprise information management system.

3.2 Design and Enterprise Information Management System of IOT Big Data Technology

This experimental analysis adopts the enterprise information management system with the Big data technology of the IOT. By collecting, analyzing and processing the data of different enterprises, more accurate and comprehensive data can be obtained, and more abundant and flexible data analysis and mining functions can be provided. By collecting device sensors and user behavior data, it can monitor and analyze various operational data within the enterprise in real-time, including

production efficiency, device health status, consumer behavior, and so on.

In the experimental analysis, this article established an enterprise information management system using a factory as an example and collected the following indicator data: production efficiency, number of equipment used, equipment failure rate, employee satisfaction, and sales revenue. Table 1 shows the statistical results of the data.

Table 1: Enterprise Information Management System Data Statistics

Enterprise	Production efficiency	Number of equipment	Equipment failure rate	Employee satisfaction	Sales volume (yuan)
Enterprise A	0.86	15	0.05	4.2	1000
Enterprise B	0.92	20	0.02	4.5	1500
Enterprise C	0.78	10	0.07	3.8	800
Enterprise D	0.81	12	0.04	4.0	900
Enterprise E	0.88	18	0.01	4.3	1200

According to Table 1, the differences between different enterprises can be observed. The production efficiency indicator reflects the production efficiency of the enterprise, and the higher the value, the better the production efficiency. The production efficiency of Enterprise B is the highest, reaching 0.92, while Enterprise C has the lowest, reaching 0.78. The device quantity indicator represents the number of devices owned by the enterprise, with higher values indicating more devices. Enterprise B has the most devices, reaching 20, while Enterprise C has the least, at 10. The equipment failure rate index indicates the failure rate of the equipment, and the lower the value indicates the more stable the equipment operation. Table 1 data shows that the equipment failure rate of enterprise E is the lowest, only 0.01, while enterprise C is the highest, reaching 0.07. The employee satisfaction index indicates the satisfaction degree of employees to the working environment and treatment. The higher the value is, the higher the employee satisfaction is. In enterprise B, the employee satisfaction is the highest at 4.5, while enterprise C has the lowest employee satisfaction of 3.8. Finally, the sales volume indicator represents the sales performance of the enterprise, and the higher the value, the greater the sales volume. Enterprise B has the highest sales volume of 1500 yuan, while enterprise C has the lowest sales volume of 800 yuan. It can be found that there is a certain relationship between different indicators and the operation status of enterprises.

3.3 Design Results of the Enterprise Information Management System for the Big Data Technology of the IOT

The IOT big data technology plays an important role in the design of enterprise information management system. First of all, through the connection and data collection of the IOT devices, enterprises can obtain all aspects of data in real time, including equipment status, production indicators, customer feedback and so on, so as to provide a more comprehensive information foundation. Secondly, the application of big data technology of the IOT makes data analysis and mining more efficient and accurate. Through the mining and analysis of a large amount of data, enterprises can find the laws and trends hidden behind the data, so as to provide a more scientific basis for decision-making.

4. Design Results and Discussion of the Enterprise Information Management System of the Big Data Technology of the IOT

4.1 Design Status of the Enterprise Information Management System for the Big Data Technology of the IOT

In today's information age, the rapid development of the big data technology of the IOT has provided brand-new opportunities and challenges for the design of the enterprise information management system. Nowadays, more and more enterprises realize the importance of the IOT big data technology in enterprise information management, and actively explore and apply this technology. However, there are some problems and shortcomings in the current situation, such as information island, data security and data analysis capabilities.

4.2 Design and Verification of the Enterprise Information Management System for the Big Data Technology of the IOT

In order to verify the effectiveness of the IOT big data technology in the design of enterprise information management system, an empirical study is conducted. For a large manufacturing enterprise, an enterprise information management system based on the big data technology of the IOT is designed, and compared with the traditional information management system. By collecting, sorting out and analyzing the existing data, the results show that the enterprise information management system based on the big data technology of the IOT has shown better results in data acquisition, storage and analysis than the traditional system, as shown in Figure 3:
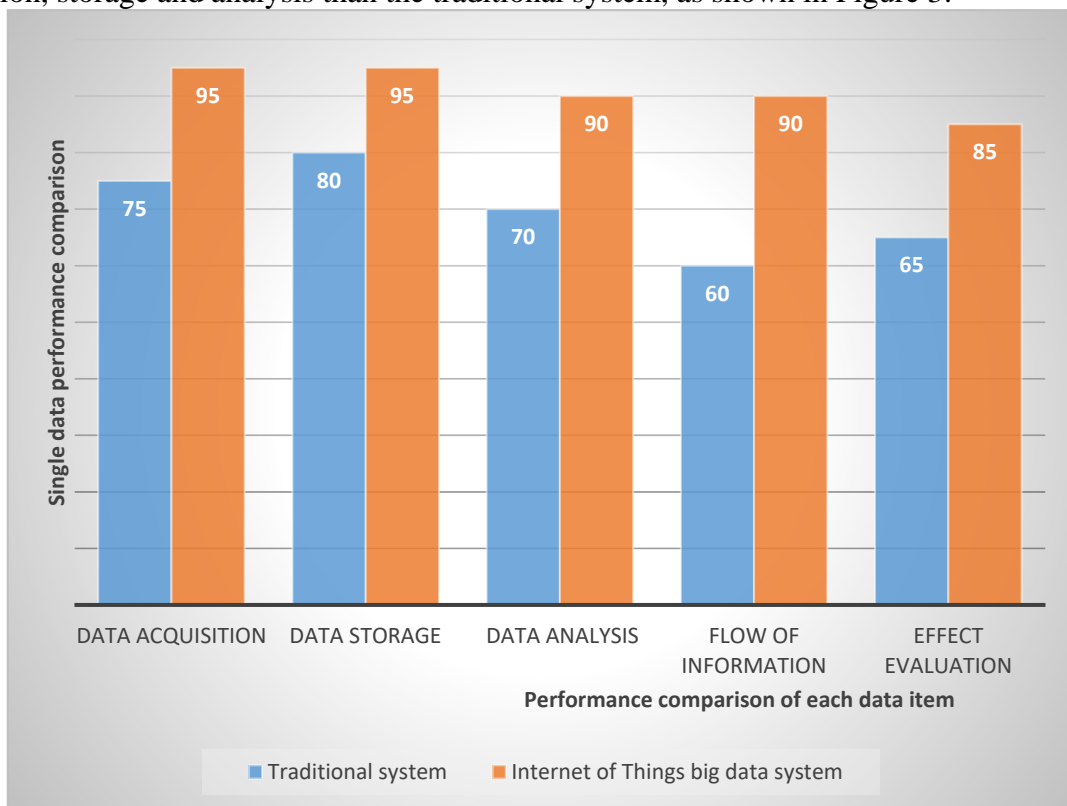

Figure 3: Performance Comparison of the enterprise information management system

Figure 3 compares the performance of traditional systems and IOT big data systems in terms of data acquisition, data storage, data analysis, information flow, and effect evaluation. In terms of data

acquisition, the traditional system scored 75, while the big data system of the IOT scored 95. This indicator evaluates the ability of the system to acquire data. The big data system of the IOT performs better in data acquisition and scores higher than the traditional systems. In terms of data storage, the traditional system scored 80, while the big data system of the IOT scored 95. This metric evaluates the ability of the system to store the data. The big data system of the IOT performs better in data storage and scores higher than the traditional systems. In terms of data analysis, the traditional system scored 70, while the big data system of the IOT scored 90. This indicator evaluates the ability of the system to analyze the data. The big data system of the IOT has higher scores in data analysis and has more analytical ability than traditional systems. In terms of information circulation, the traditional system scored 60, while the big data system of the IOT scored 90. This index evaluates the flow efficiency of information in the system. The big data system of the IOT scores higher in information circulation and has better information circulation ability than the traditional systems. In terms of effect evaluation, the traditional system scored 65, while the big data system of the IOT scored 85. This index evaluates the system's ability to evaluate the management effect. The big data system of the IOT has higher scores in effect evaluation and can more accurately evaluate the management effect than traditional systems. It can be seen that the big data system of the IOT performs better in data acquisition, data storage, data analysis, information flow and effect evaluation, and has higher performance compared with traditional systems. This further confirms the effectiveness and feasibility of the IOT big data technology in the design of enterprise information management system.

4.3 Design Strategy of Enterprise Information Management System for IOT Big Data Technology

According to the results of empirical research, the following strategies are proposed to further optimize the design of enterprise information management system of IOT Big data technology:

1) Data integration and sharing is the establishment of a unified data platform to achieve data integration and sharing between different departments and systems. This helps to solve the problem of information silos and improve the efficiency of information circulation.

2) Data security and privacy protection is to strengthen data security management, adopt measures such as authorized access and data encryption, and protect the security and privacy of enterprise data.

3) Data analysis and mining is to enhance the ability of data analysis and mining, combine machine learning and artificial intelligence and other technologies, mine the potential value in Big data, and provide strong support for enterprise decision-making.

4) Real time monitoring and prediction is the use of IOT technology to achieve real-time monitoring of enterprise operations and production processes. It combines Big data analysis to predict potential problems in advance and take corresponding measures to improve operational efficiency and resource utilization.

5. Conclusion

Based on the big data technology of the IOT, this paper discusses its application in the design of enterprise information management system. By collecting and processing a large number of device sensor data and user behavior data, the big data technology of the IOT provides a more accurate and comprehensive data base, and provides enterprises with rich data analysis and mining functions. Through real-time monitoring and analysis of internal operation data, including production efficiency, equipment health status, employee satisfaction, etc., the enterprise can obtain a more comprehensive operation situation and problems, and make decisions and business optimization

based on the data. Through the analysis of experimental data, the important role of big data technology of the IOT in the design of enterprise information management system is verified, including improving the ability of data collection and processing, improving the efficiency of data analysis and mining, and having a positive impact on enterprise decision support and business optimization. These results provide a useful reference for enterprise managers and decision-makers, to help them to understand and apply the big data technology of the IOT, and to further promote the development and innovation of enterprises.

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